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(54) SPUTTERING TARGET MATERIAL

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a sputtering target material composed of Ag alloy and having high reflectivity and excellent sulfidation resistance.
SOLUTION: The sputtering target material is composed of the Ag alloy which is prepared by adding specific small amounts of metal component (A) selected from Ge, Ga and Sb, specific small amounts of metal component (B) selected from Au, Pd and Pt, and, if necessary, a small amounts of Cu to Ag and carrying out alloying.

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CLAIMS

[Claim(s)]
[Claim 1] Metal component [at least one sort of] (A) 0.1 - 4.9mass% and Au which are chosen as Ag from germanium, Ga, and Sb, It comes to add metal component [which are chosen from Pd and Pt / at least one sort of] (B) 0.1 - 4.9mass%. Sputtering target material for high corrosion resistance thin film formation which has the high reflection factor characterized by consisting of Ag alloys whose sum total additions of a metal component (A) and a metal component (B) are 0.2 - 5mass%.
[Claim 2] Metal component [at least one sort of] (A) 0.05 - 4.85mass% and Au which are chosen as Ag from germanium, Ga, and Sb, It comes to add metal component [at least one sort of] (B) 0.1 - 4.9mass%, and Cu 0.05 - 4.85mass% chosen from Pd and Pt. Sputtering target material for high corrosion resistance thin film formation which has the high reflection factor characterized by consisting of Ag alloys whose sum total additions of a metal component (A), a metal component (B), and Cu are 0.2 - 5mass%.
[Claim 3] The high corrosion resistance thin film which has the high reflection factor formed using sputtering target material according to claim 1.
[Claim 4] The high corrosion resistance thin film which has the high reflection factor formed using sputtering target material according to claim 2.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the thin film formed using corrosion resistance, the sputtering target material for thin film formation which raised halogen-proof nature, oxidation resistance, and sulfuration-proof nature especially, and this sputtering target material, maintaining a high reflection factor.
[0002]
[Description of the Prior Art] Generally aluminum and aluminum alloy are used for the light reflex nature electric conduction film currently used for displays, such as reflective film currently used for optical record media, such as CD (Compact Disc) and DVD (Digital Versatile Disc), and a reflective mold STN (Super Twist Nematic) liquid crystal display, an organic electroluminescence (Electro luminescence) display.
[0003] The light reflex nature thin film used for the application of an above-mentioned optical record medium and an above-mentioned liquid crystal display, an organic electroluminescence display, etc. produces the sputtering target material which generally has the property considered as a request, and is manufactured by forming membranes by the RF (RF) sputtering method or the DC (direct current) sputtering method using the sputtering target material.
[0004] Although the thin film which consists of aluminum manufactured by the above-mentioned approach or an aluminum alloy has a certain amount of reflection factor, and electric resistance is low, and it moreover has the corrosion resistance stabilized in air in order to form a passive state coat in a surface, the reflection factor of the thin film which consists of aluminum or an aluminum alloy is about 80%, when wavelength is the light which is 700nm, and cannot fully satisfy to the application as which a high reflection factor is required.
[0005] Therefore, the thin film which has a high reflection factor is required, for example, forming a thin film instead using Au or Ag being proposed by aluminum or aluminum alloy as sputtering target material, and using Ag with a reflection factor high as a thin film material for the optical disk medium represented by CD-R and DVD also about a reflective mold STN liquid crystal display is proposed.
[0006] However, Au is expensive and Ag has a problem in corrosion resistance especially halogen-proof nature (Cl etc.), oxidation resistance, and sulfuration-proof nature as compared with aluminum. For example, if it will discolor and a reflection factor will fall, if Ag reacts with a halogen like Cl, and it reacts with sulfur and oxygen, the sulfide and oxide of Ag will be generated and black-ized and a reflection factor will fall.
[0007] therefore -- for example, the thing for which a small amount of Mg is added and alloyed to JP,7-3363,A at Ag -- moreover, raising the corrosion resistance (halogen-proof nature, oxidation resistance, sulfuration-proof nature) of Ag is proposed by adding and alloying little Pd in a JP,2000-109943,A official report at Ag.
[0008] However, sufficient corrosion resistance of Ag is not acquired by these Ag alloying, either, or there are problems -- corrosion resistance and although especially halogen-proof nature (Cl etc.) improves to some extent, seldom change to Ag about sulfuration-proof nature, and sufficient corrosion resistance is not acquired.

[0009] The purpose of this invention is offering the sputtering target material for thin film formation which consists of corrosion resistance and an Ag alloy with which halogen-proof nature, oxidation resistance, and sulfuration-proof nature have been improved especially, maintaining a high reflection factor.

[0010]

[Means for Solving the Problem] As a result of repeating examination wholeheartedly that this invention persons should attain the above-mentioned purpose, to Ag this time At least one sort of germanium, Ga, and Sb of specific small quantity, If at least one sort of Au, Pd, and Pd of specific small quantity is added and alloyed Maintaining the high reflection factor which both [these] the metal component acts in multiplication, and Ag has corrosion resistance and Ag alloy halogen-proof nature, oxidation resistance, and whose sulfuration-proof nature were markedly alike, and improved especially are obtained -- when little addition of the Cu was carried out and it was alloyed further, it came to complete a header and this invention for corrosion resistance and halogen-proof nature and sulfuration-proof nature improving further especially.

[0011] Metal component [at least one sort of] (A) 0.1 - 4.9mass% and Au by which this invention is chosen in this way as Ag from germanium, Ga, and Sb, It comes to add metal component [which are chosen from Pd and Pt / at least one sort of] (B) 0.1 - 4.9mass%. The sputtering target material for high corrosion resistance thin film formation which has the high reflection factor characterized by consisting of Ag alloys whose sum total additions of a metal component (A) and a metal component (B) are 0.2 - 5mass% is offered.

[0012] This invention Moreover, metal component [at least one sort of] (A) 0.05 - 4.85mass% and Au which are chosen as Ag from germanium, Ga, and Sb, It comes to add metal component [at least one sort of] (B) 0.1 - 4.9mass%, and Cu 0.05 - 4.85mass% chosen from Pd and Pt. The sputtering target material for high corrosion resistance thin film formation which has the high reflection factor characterized by consisting of Ag alloys whose sum total additions of a metal component (A), a metal component (B), and Cu are 0.2 - 5mass% is offered.

[0013] Hereafter, this invention is further explained to a detail.

[0014]

[Embodiment of the Invention] The sputtering target material of this invention uses Ag as the base, and consists of the metal component (A) chosen as this from germanium, Ga, and Sb, a metal component (B) chosen from Au, Pd, and Pt, and an Ag alloy which add Cu by the case further and it comes to alloy.

[0015] As the above-mentioned metal component (A), germanium, Ga, and Sb can be used independently, respectively, or two sorts or three sorts may be used together. When not adding Cu, the addition of these metal component (A) the sum total -- 0.1 - 4.9mass% and the case where Cu is added 0.3 - 3mass% of within the limits preferably -- the sum total -- 0.1 - 4.85mass%, although it can consider as 0.3 - 3mass% of within the limits preferably It is suitable for germanium to use Ga at 0.1 - 1.5mass%, and to use especially Sb by 0.1 - 1.5mass% of within the limits 0.1 - 2mass%.

[0016] Moreover, each of Au, Pd, and Pt can be independently used for the above-mentioned metal component (B), or it may use together two sorts or three sorts. irrespective of [the addition of these metal component (B) adding Cu, and bending] -- the sum total -- 0.1 - 4.9mass% -- it can consider as 0.5 - 3mass% of within the limits preferably.

[0017] Although especially the relative ratio of the metal component in Ag alloy (A) and a metal component (B) is not restricted and can be changed into arbitration by above-mentioned addition within the limits of each metal component, generally within the limits of 1 / 2 - 2/1 especially 4 / 5 - 5/4 is suitable for it at the mass ratio of the metal (component A) / metal component (B).

[0018] furthermore -- the case where the sum total addition of the metal component in Ag alloy (A) and a metal component (B) does not add Cu -- 0.2 - 5mass% -- it can consider as 1 - 3mass% of within the limits preferably.

[0019] on the other hand, Cu added if needed -- the sum total of a metal component (A) and a metal component (B) -- receiving -- 0.05 - 4.85mass% -- it can be preferably used by 0.5 - 3mass% of within the limits. The sum total addition of the above-mentioned metal component in

Ag alloy in that case (A), a metal component (B), and Cu 0.2 - 5mass%, Although it can consider as 0.5 - 3mass% of within the limits preferably, and especially the relative ratio of the metal component in Ag alloy (A), a metal component (B), and Cu is not restricted and it can change into arbitration by above-mentioned addition within the limits of each metal component Generally a metal component (A) and a metal component (B) Within the limits of 1 / 2 - 2/1 especially 4 / 5 - 5/4 is suitable at the mass ratio of the metal (component A) / metal component (B), Cu is the mass ratio of Cu / metal component (A) + (B), and within the limits of 1 / 5 - 3/2 especially 1 / 2 - 1/1 is suitable for it.

[0020] Ag alloy can be manufactured by adding Cu in the above-mentioned amount further to Ag by the above-mentioned metal component (A), the metal component (B), and the case, and fusing at the temperature of about 1000 - 1050 degrees C of abbreviation to it in the metal fusion furnace where a gas furnace, a RF fusion furnace, etc. are suitable. Although the ambient atmosphere at the time of the dissolution is enough in air, an inert gas ambient atmosphere or a vacuum may be used if needed.

[0021] Although Ag used as a raw material, a metal component (A) (germanium, Ga, Sb), a metal component (B) (Au, Pd, Pt), and Cu can use what is marketed with gestalten, such as a grain, tabular, and massive, purity is usually suitable for 99.95% or more of especially thing 99.9% or more.

[0022] In this way, Ag alloy which contains a metal component (A) and a metal component (B) at an aforementioned rate in Ag, respectively is obtained. The sputtering target material which consists of this Ag alloy is maintaining the high reflection factor which Ag originally has, and, moreover, its corrosion resistance, such as halogen-proof (especially Cl) nature, oxidation resistance, and sulfuration-proof nature, is improving far compared with a conventional Ag-Mg alloy and a conventional Ag-Pd alloy.

[0023] Therefore, the sputtering target material which consists of above-mentioned Ag alloys of this invention can be advantageously used as the object for the reflective film of the optical disk medium represented by CD-R as which a high reflection factor is required, and DVD, and objects for light reflex nature thin films, such as a reflective mold STN liquid crystal display and an organic electroluminescence display.

[0024] Formation of the reflective film from the sputtering target material which consists of Ag alloys of this invention can be performed by the sputtering method of itself known, for example, the (RF RF) sputtering method, the (direct-current DC) sputtering method, the magnetron sputtering method, etc.

[0025] Hereafter, an example explains this invention still more concretely.

[0026]

[Example] Cu was added to examples 1-6 and the example 1 of a comparison - 7Ag by the metal component (A) of the amount shown in the following table 1, (germanium, Ga, Sb), the metal component (B) (Au, Pd, Pt), and the case, after heating and fusing in temperature of about 1050 degrees C in a gas furnace, it cast in mold, it was processed and sputtering target material was produced.

[0027]

[Table 1]

表1

	試料No.	組成
実施例	1	Ag-1mass%Ga-0.7mass%Pd
	2	Ag-1mass%Ge-1mass%Au
	3	Ag-1mass%Sb-1mass%Au
	4	Ag-0.7mass%Ge-1mass%Au
	5	Ag-0.5mass%In-1mass%Au-0.5mass%Cu
	6	Ag-0.7mass%Ge-0.7mass%Pt
比較例	1	Ag—0.01mass%Sb-0.01mass%Au-0.1%Cu
	2	Ag-2mass%Ga-4mass%Pd
	3	Ag-1mass%Au
	4	Ag-1mass%Pd
	5	Ag-1mass%Sb
	6	Ag
	7	Ag-0.9mass%Pd-1mass%Cu

[0028] The thin film whose thickness is about 200nm was made to form on a glass substrate by the RF sputtering method using this sputtering target material.
[0029] The glass substrate to which the obtained thin film adhered was exposed into atmospheric air, and oxidation resistance was examined. Moreover, another glass substrate to which the thin film adhered was immersed into 10% salt (NaCl) water solution and 0.01% sodium-sulfide (Na2S) water solution, respectively, and halogen-proof (chlorine) nature and sulfuration-proof nature were examined. In each trial, viewing estimated the condition of the thin film after predetermined time. A result is shown in the following table 2.
[0030]
[Table 2]

表2

		耐候性試験結果			耐硫化性試験結果		
		大気暴露試験(大気中放置)	浸漬試験(10%NaCl水溶液)		浸漬試験(0.01%Na2S水溶液)		
		暴露時間	浸漬時間		浸漬時間		
	試料No.	24Hr	10Hr	24Hr	3min	10min	30min
実施例	1	変化無	変化無	変化無	変化無	極薄茶色に変色	薄茶に変色
	2	変化無	変化無	変化無	変化無	極薄茶色に変色	薄茶に変色
	3	変化無	変化無	変化無	変化無	極薄茶色に変色	薄茶に変色
	4	変化無	変化無	変化無	変化無	極薄茶色に変色	薄茶に変色
	5	変化無	変化無	変化無	変化無	極薄茶色に変色	薄茶に変色
	6	変化無	変化無	変化無	変化無	極薄茶色に変色	薄茶に変色
比較例	1	薄茶に変色	黄色に変色	黄色に変色	茶色	黒紫色	黒紫色
	2	変化無	変化無	変化無	変化無	極薄茶色に変色	薄茶に変色
	3	変化無	変化無	変化無	極薄茶色に変色	茶色に変色	濃茶色に変色
	4	変化無	変化無	変化無	極薄茶色に変色	茶色に変色	濃茶色に変色
	5	薄茶に変色	黄色に変色	黄色に変色	変化無	極薄茶色に変色	薄茶に変色
	6	薄茶(一部に濃茶)に変色	黄色に変色	黄色に変色	茶色	黒紫色	黒紫色
	7	変化無	変化無	変化無	極薄茶色に変色	茶色に変色	濃茶色に変色

[0031] Moreover, when the reflection factor (vertical-incidence light) of the light in the 500-700nm wavelength region of the thin film immediately after obtained production was measured, each reflection factor of the thin film of examples 1-6 was 90% or more. On the other hand, the reflection factor of the thin film of the example 2 of a comparison was 80 - 90%, and its reflection factor was low.

[Translation done.]